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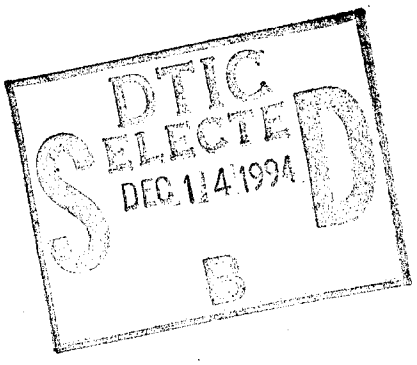

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The Pediatric Nurse Practitioner and Self-Management of Asthma

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A Seminar paper submitted to the faculty of the Graduate School of the University of Maryland in partial fulfillment of the requirements for the degree of Master of Science, 1994.

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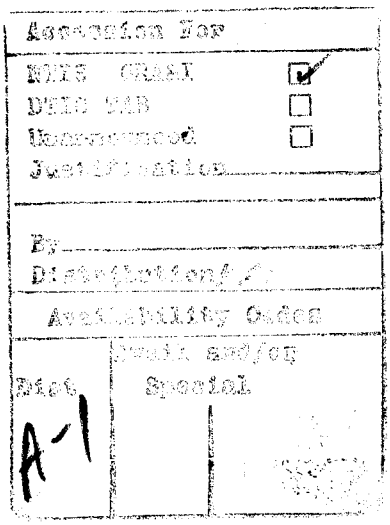

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Abstract

The purpose of this paper is to point out that patient education about the causes and management of asthma can significantly reduce health care deficits and the accompanying restriction of daily activities. It also discusses some guidelines that the PNP can use to tailor asthma education to the individual patient and reviews some prepared education programs that have been effective for children. The overall emphasis is to help patients improve the management of their asthma. This means that the PNP must assess patient knowledge deficits, patient learning abilities, and deal effectively with patient reluctance to participate with their own care. An effective asthma self-management program can minimize admission to hospital or disruption to the patient's life. This paper points out that the Orem's self-care model can be applied in determining self-care deficits and developing an individualized age-appropriate nursing system. An educative-supportive nursing system can be applied in teaching asthma self-management skills in school age children. This paper proposes guidelines for the care of asthma that incorporate Orem's Self-Care Model with individual patient developmental levels.

Chapter I

INTRODUCTION

Scope of Problem

Despite improved medical therapeutics, mortality and morbidity rates from asthma have increased over the past decade. In the second National Health and Nutrition Examination Survey (NHANES II) conducted by the National Center for Health Statistics from 1976 to 1980, asthma was present in 3.6% of children 3 to 17 years of age when determined by the presence of physician-diagnosed asthma, but in 5.3% when determined by presence of trouble with wheezing (Gergen, Mullally & Evans,1988). In the late 1980s, a survey of pediatricians indicated that almost 50% had the impression that they were treating more children for asthma than 5 to 10 years ago. Data regarding limitation of activity, number of days lost from school, and hospitalization rates all indicate a trend toward increasing morbidity from asthma in children under15 years of age (Bloomberg & Strunk,1992). During the1970s, asthma mortality for both children and adults ages 5-34 decreased by approximately 7.8% per year. However, during the 1980s, this trend reversed and mortality increased by 6.2% per year. The rate of increase was greatest in children aged 5-14 years and somewhat slower in individuals aged 15-34 years (Conboy, 1985).

Death due to asthma is not a new phenomenon, but until recently it has not been widely recognized (Sears,1988). The mortality data indicate that advances in medications for treatment of asthma have not prevented deaths. In 1975, the cost of caring

for the approximately 8 million asthma patients in the United States was estimated to be $805,721,000 (National Institute of Allergic and Infectious Diseases,1979). Reinke and Hoffman (1992) stated, "In 1990, Americans spent an estimated $1.6 billion on asthma-related in-patient hospital care and another $295 million on emergency services" (p. 40).

Explanations for rising prevalence, morbidity, and mortality are varied. Halfon and Newacheck (1993) have attributed increased hospitalization to changes in the natural history and severity of the disease, improved diagnosis, untoward effects of treatment, and increased tendencies for asthmatic patients to use hospital emergency departments as primary sources of care. Studies have demonstrated that poor children living in inner cities are more likely to be hospitalized because of asthma, and receive routine care in emergency departments (Mullally, Howard, & Hubbard, 1984). Failure to receive ongoing preventive care for asthma has been shown to be associated with limited availability of appropriate medications and has been linked to increased rates of preventable hospitalizations (Mullally, et al., 1984).

Recent publications from New Zealand and Canada suggest a relationship between death and overuse of ß-agonists, particularly fenoterol, but also albuterol (Spizer, Suissa & Ernst, 1992). Sears (1988) concluded that regular use of fenoterol, compared with as-needed use only, may produce poorer control of asthma. A study of five deaths over a 3-month period from June 9 through August 12

in St. Louis highlights the profile of fatality-prone individuals with asthma. The patients were 10 to 19 years of age. There was no common exposure to environmental, infectious, or therapeutic agents. They were all African-Americans and of low socioeconomic class. All were entirely responsible for regulating their own medication. Each of the patients had severe limitations of physical activity because of asthma for several weeks before their deaths. There was a lack of appreciation of the severity of their asthma by medical personnel and a sense of resignation to ongoing symptoms and suffering in the families. Each patient died at home or on the way to an emergency room shortly after the parents recognized the severity of the asthma (Birkhead, Attaway & Strunk, 1989). Another contributing factor is poor compliance with prescribed medical regimens (Howell, Flaim & Lung, 1992).

Significance of Problem to Nursing

Bloomberg & Strunk (1992) point out that although there are children who die unexpectedly, most deaths are believed to be preventable. Early communication with the health care provider that prompts a change in therapy is lacking in many of the case histories of deaths. Relatively inexpensive intervention strategies—such as health education, regular follow-up, and preplanned home care—can substantially reduce hospitalization and emergency department visits (Reinke & Hoffman, 1990). Because patient behavior plays a major role in the prevention or

precipitation of acute asthma attacks, the educator role of pediatric nurse practitioner (PNP) is of vital importance. The PNP can and should take the opportunity to emphasize patient education during each asthmatic patient's clinic visit or hospitalization.

At least 11 asthma education programs for children have been developed since 1977 in the U.S., and evidence from these programs indicates that they can produce decreased asthma morbidity as measured by fewer hospitalizations and emergency room visits (Hindi-Alexander, 1987; Wilson-Pessano & McNabb, 1985). One study demonstrates that clinical nurse specialist (CNS) involvement influenced reduced emergency room (ER) utilizations. Twenty-one asthmatic children, aged 15 months to 13 years, from low-income families, who used the emergency room as their primary source of asthma care, were evaluated by the physicians of the Pediatric Allergy Division at baseline. These children were then randomly assigned to either a control group (pediatric residents and staff) or a clinical nurse specialist (CNS). After assessing individual family needs, the CNS counseled each family regarding preventive health measures, focusing on early recognition of asthma exacerbations and self-care. During the12-month study period, the frequency of allergy physician contacts and the total number of outpatient department visits were similar in both groups. However, compared with the 12-month period prior to enrollment, the CNS group demonstrated a significant

reduction in the frequency of emergency room visits (2.6 ± 1.1 for prior 12 months versus 0.6 ± 0.9 ER visits per patient after the program; $p<0.001$). Control group subjects demonstrated no change in emergency room utilization (2.5 ± 1.5 versus 2.4 ± 2.1 ER visits per patient). CNS intervention based on the Orem Self-Care Nursing Model was shown to significantly reduce emergency room utilization by asthmatic children for these low-income families (Alexander, Younger, Cohen, & Crawford, 1988), and clearly demonstrates the importance of patient education in decreasing asthma related morbidity and the potential of the nurse to make a difference.

The health care provider needs to develop a strategy for management of high-risk children with asthma. Patient and family education should be undertaken in conjunction with an effective therapeutic regimen that reduces and controls symptoms and improves lung function (Bloomberg & Strunk, 1992). Patient education should begin at the time of diagnosis and be integrated with continuing care (National Asthma Education Program [NAEP], 1991). The education program should emphasize self-care. However, the nurse practitioner should not assume that knowledge alone will improve compliance (Tettersell, 1993). Tettersell (1993) notes that patients with chronic diseases should be encouraged to manage their condition under the supervision of health professionals, but the management must be viewed by the patient as in their best interest. According to Waterworth & Luker (1990)

some patients may be 'reluctant collaborators' and do not want the responsibility of making decisions about their condition. If a 'partnership' can be fostered between the patient and health professional, patient reluctance may be ameliorated. Education that emphasizes self-care must allow the child and his/her family to discuss their views on treatment. Conboy (1990) states that the goal of self-care in asthma is teaching families how to make informed decisions about their child's asthma with the assistance of their health care providers. Teaching can be done in the physician's office on a one-to-one basis, in group programs conducted after office hours, in a school setting, or in a community setting such as a camp.

The purpose of this paper is to (1) review current management and treatment of asthma, (2) review existing asthma self-management programs, (3) examine the effectiveness of self-management programs, (4) discuss Orem's self-care nursing model in teaching self-care skills to school-age children and (5) discuss implications and recommendations for future nursing practice, theory and research.

Chapter II

REVIEW OF LITERATURE

Overview of Asthma

Definition and Epidemiology

There is no universally accepted definition of asthma, however "It may be regarded as a diffuse, obstructive lung disease with (1) hyperreactivity of the airways to a variety of stimuli and (2) a high degree of reversibility of the obstructive process, which may occur either spontaneously or as a result of treatment" (Behrman, Kligmen, Nelson & Vaughan, 1992, p. 587). Asthma is also known as reactive airway disease (RAD). RAD includes wheezy bronchitis, viral-associated wheezing, and atopic related asthma (McWilliams, Kelly & Murphy, 1989).

Asthma is the most common chronic childhood illness and a leading cause of school absences. There are two to five million children with asthma in the United States and the prevalence appears to be increasing (Traver & Martinez, 1988). The highest incidence of asthma occurs in the first few years of life; about half the new cases of childhood asthma appear in children 1 year of age or younger. In the very young, asthma is more common and more severe in boys than in girls. In older children, this sex differential disappears (König, 1987; Green & Haggererty, 1984). However, it has been found that the younger the child at the onset of symptoms and the more severe the symptoms, the more likely the asthma will persist (Bronninmann & Burrows, 1986; König, 1987).

Asthma seems to be more prevalent today than in the past

and there seems to be a trend over time to make the diagnosis of asthma more readily (Bloomberg & Strunk, 1992). Physicians now have more awareness and availability of diagnostic tests such as pulmonary function tests and methacholine and exercise challenges to help in identifying patients not previously diagnosed. As a result, children who wheeze with respiratory infections may now be diagnosed with asthma, rather than bronchitis with wheezing (Cloutier & Loughlin, 1981).

African-American children have significantly more asthma than white children (9.4% vs 6.2%, respectively). Some of these racial differences can be accounted for by differences in exposure to risk factors known to be associated with poverty, such as low family income, poor nutrition and lack of breast feeding (Gergen, Mullally, & Evans, 1988). Bloomberg & Strunk (1992) note that living in the inner city is a risk factor for asthma in both whites and African-Americans, even after taking into account maternal age and low birth weight.

Pathophysiology

Asthma episodes occur progressively with worsening shortness of breath, cough, wheezing, chest tightness, or some combination of these symptoms (NAEP, 1992). The major effect of asthma is air way obstruction and slowing of forced expiration. Initially the obstruction is the result of bronchial spasm, mucosal edema, and excessive secretion (Stempel & Mellon, 1984). In the presence of

hyperreactive airways, various allergic and nonspecific stimuli initiate the bronchoconstriction and inflammatory response (Behrman et al., 1992).

In normal breathing, the caliber of intrathoracic airway is smaller during expiration compared with inspiration. Thus the airway obstruction occurring with asthma is most evident on expiration (Traver & Martinez, 1993). As airways narrow, air is trapped behind occluded or narrowed small airways. The trapped air raises the functional residual capacity of the lung and the asthma patient breathes close to his or her total lung capacity (NAEP, 1992). Chest auscultation reveals a prolonged expiratory phase and wheezing. The wheezing heard is often polyphonic because the degree of airway narrowing is not uniform throughout the lung (Traver & Martinez,1993; Behrman et al.,1992).

During asthma exacerbations, patients use accessory muscles of respiration to maintain the lungs in a hyperinflated state. "Lung function tests demonstrate a decrease in peak expiratory flow rate (PEFR) and forced expiratory volume in 1 second (FEV_1). There is also a decrease in the percent of forced vital capacity (FVC) exhaled in 1 second" (Traver & Martinez, 1993, p. 222). Tachypnea, which is usually concurrent with significant bronchoconstriction, makes the sequelae of the obstruction even more obvious. Air is inhaled; however, because of airway narrowing and a shortened expiratory time, expiratory volume is limited. The result is air trapping with an increased resting lung

volume or functional residual capacity (FRC), increased residual volume, and decreased vital capacity (Fernandez & Martin, 1987).

The change in ventilatory pattern and airway obstruction also causes alterations of gas exchange. Although the total amount of gas that reaches the alveolar level is greater than normal, the distribution of that gas is not uniform (Traver & Martinez, 1993). The rapid respiratory rate and the variation in the degree of obstruction in individual airways cause some areas of the lung to receive very little gas whereas others receive large amounts (Traver & Martinez, 1993).

"Hyperventilation of some regions of the lung compensates initially for the higher carbon dioxide tension in blood that perfuses poorly ventilated regions" (Behrman et al.,1992, p. 588). The result is a blood gas pattern that reflects ventilation-to-perfusion. Actual blood gas values in such a pattern include hypoxemia (decreased PO_2) and respiratory alkalemia (decreased PCO_2 and elevated pH). A PCO_2 in the normal range (35 to 45 torr) is a danger sign during an asthma exacerbation. A PCO_2 that rises from below-normal to normal levels is due to very severe obstruction, increased production of carbon dioxide (from increased work of breathing), and respiratory muscle inefficiency (Fernandez & Martin, 1987).

Hypoxia and acidosis can cause pulmonary vasoconstriction which can lead to "damage to type II alveolar cells and diminishing production of surfactant, which normally stabilizes alveoli. Thus,

this process may aggravate the tendency toward atelectasis" (Behrman et al., p. 588).

Etiology

Various factors which exacerbate asthma can be identified, including exposure to cigarette smoke and other irritants, exercise, hyperventilation, gastric-esophageal reflux, viral infections and allergic sensitization (Bever & Stevens, 1992; Green & Haggerty, 1984). The most frequent factor in infants and children less than 5 years old, is viral infection (Sampson, 1985). However, in older children allergy becomes the most important trigger of asthma. Even in preschool asthmatic children it was found that 74% had elevated serum immunoglobin E (IgE), while 79% had positive prick tests (Kaliner & Lemanske, 1992).

A number of factors generally contribute in varying degrees to the activity of the asthmatic process:

Allergic Factors: Patients with allergic or extrinsic asthma can be divided into two sub-groups: IgE mediated (atopic) and non IgE mediated. Atopic or IgE mediated asthma is characterized by a variable and possibly a seasonal pattern. Asthma attacks follow exposure to environmental factors such as dust, pollens, and danders (Sulliaman & Townley, 1987). A study of 19,000 cases of asthma done in Australia noted that IgE-mediated asthma is responsible for 53 to 60 percent of the cases of bronchial asthma (Ford, 1983). Extrinsic asthma is more prevalent in individuals 5-

45 years of age. Intrinsic asthma is more common in infants and children of less than 4 years of age and older adults over 50. Patients have no history of atopic disease such as hay fever or eczema. Symptoms are triggered by infections, exercise and exposure. Humidity, extreme hot or cold may also trigger asthma symptoms. The serum IgE level is normal but eosinophilia may be present. The course usually is chronic and many children become steroid dependent (Suliaman & Townley, 1987).

Health care providers should suspect allergy as a contributing factor when there is a family history of allergic diseases (Duff et al., 1992). Duff & Platts-Mills (1992) further state that the clinical presentation includes seasonal exacerbations, concomitant allergic rhinitis or other allergic disease and eosinophilia in the sputum sample. Skin test results confirm IgE allergen but do not establish a cause-and-effect relationship (Kaliner & Lemanski, 1992).

Viral Infection: Viral agents are the most important infectious triggers of asthma. Early in life respiratory syncytial virus (RSV) and parainfluenza virus are most often involved. In older children, rhinoviruses have also been prevalent. Influenza virus infection assumes importance with increasing age (Behrman et al., 1992). Viral associated wheezing in infants and toddlers can begin shortly after the appearance of coryzal symptoms. If untreated, these children will cough and wheeze for 3 to 10 days after the onset of the illness (Lewiston, 1989). Many children will be completely free of these symptoms by age 5 or 6 (Behrman et al., 1992).

McIntosh, Ellis and Hoffman (1973) conducted a prospective study in 32 hospitalized children with asthma aged 1 to 5 years with clinical, microbiologic, and serologic evidence of respiratory infection. Over a 2 year time period, 139 episodes of wheezing were identified, of which 58 (42%) were associated with documented viral infection. The most frequently isolated viruses were respiratory syncytial virus, parainfluenza virus, and coronavirus.

Bacterial Infection: Presently there is little evidence to suggest that bacterial respiratory infections can influence asthmatic symptoms. However, there is some association between persistent asthma and undiagnosed bacterial sinusitis (Cypcar, Stark, & Lemanske, 1992). Rachelefsky, Katz and Siegel (1984) treated episodes of active sinusitis in 48 children with asthma and found dramatic clinical improvement in coughing and wheezing, decreased bronchodilator use, and improved pulmonary function. The mechanisms in the paranasal sinuses that precipitate an acute exacerbation of asthma are unknown but may include bacterial seeding from the upper to lower respiratory tract, a nasosinobronchial reflex (involving a trigeminal afferent and vagal efferent neural arc), or infection-induced enhancement of ß-adrenergic blockade (Cypcar et al., 1992).

Exercise-Induced: Exercise can induce an acute, reversible, usually self-terminating airway obstruction 6 to 8 minutes after strenuous exercise which can lasts 15 to 60 minutes. This is commonly known as an exercise-induced asthma (EIA). EIA is

more common among children because of their activity level. EIA occurs more frequently in those with extrinsic rather than intrinsic asthma because extrinsic asthma is more common among children (Leech & Kumar, 1985). Clinical characteristics of EIA usually include shortness of breath and chest tightness after exercise. Some children may exhibit only a cough (Leech & Kumar, 1985). Recent research has shown that bronchospasm is triggered by cooling of the airway from increased ventilation. Although water loss is not necessarily a direct factor of airway obstruction, the vaporization of water may be important in the cooling process (Anderson, 1985).

Irritants: Indoor air irritants other than allergens may be harmful to the asthma patient. The most frequent offenders are tobacco smoke, fumes from wood burning, perfumes and household aerosols (Behrman et al., 1992; NAEP, 1992).

Psychologic Factors: Emotional factors can also trigger symptoms in many asthmatic children, but 'deviant' emotional or behavioral characteristics are not more common among asthmatic children (Behrman et al., 1992)

Diagnosis

The long-standing belief that the term asthma should be avoided when talking to parents led to both underdiagnosis and undertreatment of the disease. There is little clinical value in trying to differentiate between asthma and upper respiratory

infections with wheeze because the management is identical (Speight, Lee & Hey, 1983). The assessment of a patient with asthma should start with a complete history. The history should include the degree and duration of symptoms, triggering factors, success and failures of past therapies, limitation in activity, and disruption of sleep (Stempel & Szefler, 1992). The physical examination of the child may be within normal limits if the child is not having active symptoms at the time of the examination (Traver & Martinez, 1993). Children with both wheezing and growth retardation should be investigated for cystic fibrosis, bronchiectasis, or other chronic obstructive pulmonary diseases (Eigen & Scott, 1984).

History of cough is important because approximately 5% of new asthma cases appear as cough without wheezing (Traver & Martinez, 1993). Recurrent episodes of coughing and wheezing, especially if aggravated or triggered by exercise, viral infection, or inhaled allergens are highly suggestive of asthma (Behrman et al., 1992). Laboratory findings are variable and not specific. Arterial blood gases may show low, normal, or high carbon dioxide content depending on the severity. The pH varies and can be normal or show respiratory alkalosis or respiratory acidosis depending on severity. Oxygen partial pressure may be normal or low. Blood and sputum eosinophils may be found and Curschmann's spirals and Charcot-Leyden crystals may also be present on microscopic examination of the sputum (Suliaman & Townley, 1987).

Pulmonary function tests are very helpful in diagnosing asthma. A decrease in one second forced expiratory volume (FEV1); and a decreased ratio of FEV1 to forced vital capacity (FEV1/FVC) are indicative of an obstructive pattern. An increase in the FEV1 of 10 to 20 percent in response to a bronchodilator is suggestive of asthma (Kaliner & Lemanske, 1992; Suliaman & Townley, 1987). However, failure to show such a response should not be interpreted as absolute evidence that no irreversible disease of the airways exists. A therapeutic trial with bronchodilators may be indicated (Kaliner & Lemanske, 1992).

Every child suspected of having asthma does not require chest X-ray, however it may be appropriate to exclude other possible diagnoses or complications, such as atelectasis or pneumonia. Hyperinflation occurs during acute attacks and may become chronic when airway obstruction is persistent (Behrman et al., 1992; Traver & Martinez , 1993).

In cases where the history suggests a specific allergic response, skin testing may be done. Graef (1992) stated that a history of rhinitis, conjunctivitis, and atopic dermatitis suggests an atopic predisposition, but these factors are not the only prerequisites for the development of asthma because asthma often has no other atopic component. Skin testing should include evaluation for respiratory irritants, infection (especially of the paranasal sinuses), the use of nonsteroidal anti-inflammatory drugs (NSAIDs), and the relationship of symptoms to ingestion of foods or drugs (Kaliner &

Lemanske, 1992).

The response of the asthmatic to exercise testing is unique . Running for 1-2 min often causes bronchodilation, but prolonged strenuous exercise causes bronchoconstriction in virtually all asthmatic subjects when breathing dry, relatively cold air (Behrman et al., 1992). With EIA, exercise produces a diminished air flow on expiration. Measurement of pulmonary function may be taken before exercise, immediately after, and at 5, 10, 20, and 40 minutes thereafter and compared (Leech & Kumar, 1985; Behrman et al., 1992). Abnormal findings include a reduction of FEV and forced expiratory volume in 1 sec (FEV_1) of 15% to 35% are acceptable criteria for referral. If exercise causes no airway obstruction, repeat testing on other days when relative humidity is low usually elicits a positive response in patients with asthma (Behrman et al., 1992). Other findings such as a history of wheezing and tachycardia after exercise help to support a decision to refer a child with EIA (Leech & Kumar, 1985).

Inhalation bronchial challenge testing is rarely done to explore the clinical significance of allergens implicated by skin treating, because the allergenic challenge can provoke a late-phase asthmatic response. When the diagnosis of asthma is uncertain, testing for hyperresponsiveness to the bronchoconstrictive effect of methacholine or histamine may be helpful in children old enough to cooperate in pulmonary function testing. Methacholine provocative testing should not be performed when baseline

pulmonary function is abnormal (Behrman et al., 1992). Bronchial provocation tests with methacholine or histamine can be performed in the laboratory. This test can "induce 3 types of asthmatic reactions in sensitized patients: (a) an isolated immediate asthmatic reaction; (b) an isolated late-asthmatic reaction; and (c) a dual asthmatic reaction" (Bever & Stevens, 1992, p. 38). An immediate reaction generally occurs within minutes of an appropriate dose of allergens and resolves after 30 to 60 minutes. An isolated late reaction begins approximately 3 to 4 hours after exposure and reaches maximal intensity by 4 to 8 hours and resolves in 12 to 24 hours. Dual asthmatic reactions have components from both the immediate and the late phase reactions, and a biphasic period of asthmatic symptoms can be seen after a single antigen challenge or exposure (Bever & Stevens, 1992).

Pharmacologic Intervention

The goals of asthma therapy are immediate bronchodilation to relieve airway obstruction and the resolution of the inflammatory process in the airways (Stempel & Szefler, 1992). These are important concepts for patients who are willing to learn about them and the PNP should be prepared to instruct children and their families properly. There have been profound changes in the selection of primary and secondary medications for asthma. Asthma is not a "one drug" disease, and the PNP must be familiar

with relative advantages and disadvantages of all available medications.

Asthma constitutes 2 kinds of physiopathological reactions: bronchospasms (immediate asthmatic reaction) and inflammatory reactions (late asthmatic reaction). The treatment should be directed toward these 2 events (Bever & Steven, 1992). The approach to pharmacologic therapy is often described as "step-care", in which a combination of medications and frequency of administration are increased as necessary (Stempel & Szefler, 1992; NAEP, 1992). The immediate need is to provide a bronchodilator effect to relieve airway obstruction. The next step is to resolve the inflammatory process in the airways with consequent improvement in pulmonary function and reduced airway hyperresponsiveness (Stempel & Szefler, 1992; Bever & Stevens, 1992). Finally, the airways must be protected from inflammatory response to allergens and irritant stimuli (Stempel & Szefler, Behrman et al., 1992).

Asthma medications can be grouped into those that are "primarily bronchodilators (ß-adrenergic agonists, theophylline, anticholinergics) and those that are considered antiasthma drugs (cromolyn, glucocorticoids, and nedrocomil)" (Stempel & Szefler, 1992, p. 1298).

Bronchodilators (ß-Adrenergic agent)

Adrenergic stimulants (agonists) are the most popular type of maintenance therapy in asthma and bronchitis. This class of drugs can affect three types of physiologic receptors: a, $ß_1$, and $ß_2$. The advantage of this class of medications is their rapid onset of effect in relief of acute bronchospasm (Stempel & Szefler, 1992). The most frequently used $ß_2$ agonists are albuterol, terbutaline, and metaproterenol. These agents have selectivity for bronchodilatation with minimal cardiac side effects (Stempel & Szefler,1992; Traver & Martinez, 1988). These "newer $ß_2$ agonists have a longer duration of action and less cardiac effects than older bronchodilators such as epinephrine and therefore are preferred" (Traver & Martinez, 1988, p. 228). These drugs also have excellent bronchoprotective effects for pretreatment of exercise-induced asthma. Prior to allergen exposure, these drugs are useful in blocking early pulmonary response but not very effective preventing the late-phase reaction (Stempel & Szefler,1992; Bever & Stevens, 1992). The most effective route of administration of ß-adrenergics is by inhalation. Oral preparations may be used in young children, individuals who cannot master proper inhalation techniques, or in long-acting forms to treat nocturnal symptoms (Stempel & Szefler, 1992).

Successful use of inhaled ß-agonists is obtained only after proper inhalation technique is reviewed. All too often it is assumed that patients who have used an inhaler in the past know

proper skills of inhalation (Shim & Williams, 1980). The proper use of metered-dose inhalers is important for the treatment of asthma, however, many patients misuse this device. Patients should demonstrate the use of the metered-dose inhaler to the PNP and the PNP should review the technique whenever she/he sees the patient. The steps for correct inhaler technique are described in the Appendix 1. The PNP should also suggest that the child keep his/her inhaler clean by keeping it capped when it's not in use and washing it with soap and water, or running it through the dishwasher every once in a while. The asthmatic child should know that his/her inhaler contains sufficient medication for therapy. To determine how much medication the canister contains, the child can fill a basin with water and put his/her canister in it. "If it sinks, it's full; if it bobs up with just a bit of the bottom end above the water, it's half full; if it floats like a dead fish, it's empty" (American Lung Association, 1993, p. 24).

The most common mistake in administration of metered-dose inhalers is that timing of inhalation and depression of the canister do not occur simultaneously. Using a spacer device such as an Aerochamber or InspirEase may overcome the difficulty with coordination. Large volume spacers (500-750 cc) may actually improve deposition of the drug in the lungs (Stempel & Szefler, 1992). Inhaled bronchodilators are important in all phases of asthma. They can be used before inhaled anti-inflammatories if cough or wheeze symptoms are present, as pretreatment for

exercise or allergen exposure, and during acute flare-ups of asthma (Stempel & Szefler, 1992; Behrman et al.,1992). Doses of the ß-agonists are generally adjusted according to the age and size of the child.

Bronchodilator (Theophylline)

Theophylline's main advantage is its long duration of action, which is especially useful in the management of nocturnal asthma (Stempel & Szefler, 1992). This is a particular advantage to patients who use inhaled $ß_2$ agonists, wake up during the night and are symptomatic. The inhaled $ß_2$ agonists have a duration of activity of only 4 to 6 hours, whereas the sustained-release theophylline preparations last for at least 8 hours and many for 12 hours (Stempel & Szefler,1992). In the early 1980s, long-acting theophylline preparations were the foundation of asthma care. The initial enthusiasm for long-acting theophylline was the belief that serum levels could be easily titrated to achieve maximal efficacy. Unfortunately, theophylline levels rather than the patient response became the driving force (Traver & martinez,1988; Stempel & Szefler, 1992). Theophylline levels should be maintained below 15 μg/mL to minimize the risk for adverse effects. Behavior changes, enuresis, nausea, vomiting, and headache should alert the provider to monitor serum levels and alter dosage (Stempel & Szefler, 1992). Another source of concern is the potential effect of viral respiratory illness or fever on theophylline metabolism. Decreased clearance of theophylline

during viral infection or fever may result in increased serum theophylline concentrations and the possibility of serious side effects. Patients at risk appear to be those who receive high-dose theophylline treatment. For this reason, dosage above 28 mg/kg/day should be avoided (Levin,1991; Stempel & Szefler, 1992).

Bronchodilator (Anticholinergics)

The two anticholinergic agents most commonly used in children are atropine, a belladonna alkaloid, and ipratropium (Atrovent) (Levin,1991). Ipratropium is a relatively new agent with mild side effects, like nervousness, dizziness, dry mouth, and GI distress, in less than 3% of patients. Ipratropium is available as an MDI and dosed in 1 to 2 puffs, four times daily. Ipratropium has been used effectively in young children with acute asthma along with $ß_2$ agonists but is currently only approved for those 12 years and older (Levin,1991; Stempel & Szefler,1992).

Antiasthma Drug (Cromolyn Sodium)

Cromolyn is not a bronchodilator, but it is very effective as a preventive maintenance medication. It blocks both the early and late phase pulmonary response to allergen bronchial challenge (Stempel & Szefler,1992; Graef,1992). However, it has limited effects for the treatment of type 2 nonallergic asthma. When used for chronic asthma, cromolyn requires 2 to 4 weeks for the maximum effects to be elicited. When used to prevent exercise-induced asthma, cromolyn is best used 10 to 60 minutes prior to

exercising to achieve maximum effects (Levin,1991). It is available as a spin-haler, as a metered-dose inhaler, or as a solution for nebulization. The nebulized form usually does not irritate the airway as the spin-haler powder form sometimes does, and therefore it can be given even with acute wheezing (Graef;1992, Stempel & Szefler, 1992).

Anti-inflammatory (Glucocorticoids)

Glucocorticoids represent the most potent anti-inflammatory agents available for the treatment of asthma. These drugs act as anti-inflammatory agents in late-phase asthma in an unknown way to decrease asthmatic symptoms (Stempel & Szefler, 1992; Levin, 1991). They are mostly used as inhalants, but in severe cases systemic steroids such as prednisone are used. There are four inhaled steroids used for asthma: beclomethasone (beclovent, vanceril), dexamethasone (decadrone), triamcinoline (azmacort), and flunisolide (aerobid). Except for flunisolide, all the others are used in a dosage of 1 to 2 puffs, 3 to 4 times daily (Levin,1991; Stempel & Szefler,1992). The side effects are minimal. The major complication is oral candidiasis and occasionally the aerosol may precipitate bronchospasm (Graef,1992).

Oral steroids are used in the treatment of acute flare-ups of asthma that have not responded to treatment with bronchodilators and are not controlled with antiasthma medications. They may be necessary when starting inhaled antiasthma medications to improve lung function, reduce inflammation, and allow for proper

deposition of these medications in the airway (Stempel & Szefler,1992; Levin, 1991). Outpatient treatment with 2 mg/kg/day divided in two equal doses is suggested in most cases. Therapy should be continued for 4 to 7 days depending on the clinical response (Stempel & Szefler,1992).

Classification

Categorizing asthma as mild, moderate, or severe helps to guide selection of appropriate medication. The categories relate asthma severity to objective peak expiratory flow rate (PEFR) determinations (NAEP, 1992).

Mild Asthma: "Mild asthma is characterized by episodes of wheezing that cause PEFR or FEV_1 to decrease by 20 percent or less and by asymptomatic periods between exacerbations" (NAEP, 1992, p. 79). Children with mild asthma have intermittent, brief wheezes, cough, chest tightness and dyspnea up to once a week. These symptoms are not severe and respond to bronchodilator treatment within 24-48 hours. Generally, medication is not required between attacks when the child is essentially free of symptoms of airway obstruction (Reinke & Hoffman; Behrman et al., 1992). Children with mild asthma have good school attendance, good exercise tolerance, and little or no interruption of sleep by asthma (Behrman et al., 1992). These patients can be treated with inhaled $beta_2$-agonists without the need for continuous anti-inflammatory treatment. If symptoms disappear

and pulmonary function normalizes with inhaled beta$_2$-agonists, they can be used indefinitely on an as-needed basis (Fizgerald, 1992; Bever & Stevens, 1992).

Moderate Asthma: Moderate asthma is characterized by more than two acute asthma exacerbations per week, with PEFR or FEV_1 decreasing 20 percent or more (from predicted or personal best) (NAEP, 1992). Children with moderate asthma have poor school attendance, diminished exercise tolerance and loss of sleep at night (Behrman, et al., 1992). They generally require continuous rather than intermittent bronchodilator therapy to achieve satisfactory control of symptoms, and may require continuous treatment with cromolyn or inhaled corticosteroid to reverse bronchial hyperresponsiveness (Behrman et al., 1992).

Severe Asthma: Children with severe asthma have daily wheezing and more frequent exacerbations which require frequent hospitalizations. Because of severe exacerbations, they miss significant amounts of school, have their sleep interrupted and have poor exercise tolerance (Behrman et al., 1992; Stempel & Szefler, 1992). Pulmonary function tests show PEFR or FEV_1 fluctuations of 20-30 percent between the premedication and postmedication measures. Precipitous drops in PEFR or FEV_1 are also noted during their worst exacerbations. Bronchodilator medication is required continuously and regimens include regular systemic or aerosol administration of corticosteroids. In severe asthma, there may be significant morbidity from both the disease

and from oral prednisone therapy (Behrman et al., 1992; Stempel & Szefler, 1992).

Nonpharmacologic Intervention

Many children with asthma are allergic to common indoor inhalant allergens, particularly dust mites, pets, and cockroaches. Continued exposure of sensitized children to allergens is now considered to be an important cause of the ongoing inflammation in their lungs, which correlates with asthma (Stempel & Szefler, 1992). The PNP should counsel the child and parents on reducing exposure to mites or other allergens which produce asthma symptoms. In managing allergy related asthma, the PNP should emphasize education and reinforcement. The first emphasis should be explaining many aspects of the illness such as the genetic basis, symptoms of allergies, and prognosis. The next explanation should emphasize that the amount of relief from symptoms is often in direct proportion to the allergen removal from the environment or diet. Immunotherapy is sometimes used in treating allergy related asthma. This is a controversial area and is not the initial therapeutic intervention, During hyposensitization, increased doses of the allergen to which the child is allergic are injected. Except in the case of allergy to bee venom, it is not known how hyposensitization works but some persons do receive clinical benefit (Traver & Martinez,1988).

Psychosocial Aspects of Asthma

Many children with asthma worry about death and side effects of medication, and have doubts concerning their physical ability. Even if the asthma is mild, parents often regard their child's asthma as life threatening. This poses a particular problem for the health care provider who wants to reassure the parents and child but is also aware of the reports of increased fatalities in asthma (Bloomberg & Strunk, 1992). Almost one half of parents report that asthma has an adverse effect on their child's emotional life (Bloomberg & Strunk , 1992). The children feel restricted socially, are embarrassed about taking medication, perceive themselves to be different from other children, and are fearful about attacks. Emergency room visits and nighttime attacks add to the child's sense of vulnerability and emotional stress and cause the child and parents to lose valuable sleep (Gergen, Mullally & Evans, 1988).

Asthma is a major problem in the school setting. Children are placed in the position of having to ask permission to leave the room to treat their asthma. Most schools do not allow children to keep their inhaler in the classroom. As a result, children may delay treatment of individual attacks and increase the probability that they will have to leave school because of asthma. Many teachers and school administrators have a high level of discomfort with asthma and this contributes to the high level of absenteeism in children with asthma (Allen & Hansburys, 1989).

Asthma Education Programs

Many asthma education programs have been developed during the past decade. Most of these programs encourage self-management. Self-management education provides the patient with educational experiences to promote changes in behavior that will lead to improvements in health status and enhancement of the quality of life (Wilson-Pessano & McNabb, 1985; Conboy, 1985). Several standardized asthma education programs can be obtained from the National Heart, Lung and Blood Institutes, the American Lung Association, and the Asthma and Allergy Foundation of America. These programs advocate increased transfer of the management of the child's asthma from the physician to the family and/or the child (Lewis, 1983). All programs involve the parent and use examples of interactive skills to translate medical advice into practice in the family's daily life (Conboy, 1985).

Programs in Summer Camp Settings

A number of asthma self-management programs are conducted in summer camp environments. In the camp, children are taught to take their medications under supervision and to participate in a variety of recreational activities. Chipps, Mak, Menker, Schuberth, Talamo, Talamo, Permatt, Scherr and Mellittis (1984) reported that children who spend time in Camp Wheeze and Camp Bronco demonstrated improvement in pulmonary function (FEV_1 as a

percentage of predicted value) over 8 weeks at the residential camp. No attempt was made to relate this improvement to the educational component of the experience. However, Blessing, Landom, Miza, Palma and Bergman (1981) presented self-report data that indicated many parents felt there was an improvement in their child's asthma condition following the day camp experience. These reports ranged from 28% reporting decreased visits to the physician and fewer hospitalizations, to 62% reporting less school absenteeism due to asthma, and 82% reporting an increased understanding of asthma. Unfortunately, there were no control groups in either of these studies, and any improvement observed may have been due to other factors, such as seasonal variation or maturation of the subjects, or to biases in the reports of change.

School-Based Programs

Parcel, Nader and Tierman (1980) developed a program for the school setting. Instruction involved a 40-minute class once a week for 24 week and utilized teachers, school psychologists, and nurses. Parents were encouraged to become involved and were given suggestions via the children's text, "Teaching My Parents About Asthma". Use of this program significantly increased knowledge of asthma and the internality of health locus of control for children in the experimental group. However, changes were not very large (i.e., only improved knowledge on 1.5 items of a 20-item

knowledge test). Medical outcomes (frequency of asthma attacks and health services utilization) were not significantly changed by the program. Parcel et al. (1980) attributed this lack of success to the program's inability to address individual needs of the children and recommended that individualized education for children with asthma be an integral part of their medical care.

Open Airway

This group program was developed at the Columbia-Presbyterian Medical Center in New York. It is the only program identified in the literature that has focused specifically on an inner-city population, including a high proportion of persons speaking only Spanish and having little formal education (Conboy, 1985; Howell, et al., 1992). The program curriculum is based on group dynamics. Children and families learn asthma management skills from each other. Open Airway is unique in that it can be used with children 4-7 and 8-14 years of age. Paring educational sessions in the program with clinic visits appears to increase compliance. (Conboy, 1985; Wilson-Pessano & McNabb, 1985).

This program was developed by interviewing a sample of 290 families of children with asthma and identifying the asthma-related management behaviors of parents. An educational program was developed based on the interview findings. Although the program focuses on the family, self-management skills were also taught to children. The program consists of seven group sessions

for parents and children. These sessions deal with information and feelings about asthma, medications, making decisions about activities, managing an attack, communicating with physicians, keeping healthy, preventing attacks, and solving school problems.

To evaluate the program, 207 families were randomly assigned to receive education; 103 families were designated as controls. The attrition rate and incomplete attendance records were significant in this trial. However, 73% were reinterviewed 12 months after the program and records of hospitalizations, emergency room visits, school absences, and grades were obtained. Parents who received the educational program increased the number of steps they took to manage asthma by 18%, a statistically significant difference from the change (a 9% decrease) in the control group (Wilson-Pessano & McNabb, 1985). In terms of utilization of services, among children who had one or more hospitalizations in the baseline year, hospitalizations decreased by 83% and emergency room visits by 52% in the education group. This was significantly different from the decrease of 25% and increase of 1% in these utilization variables for the control group (Conboy, 1985; Wilson-Pessano & McNabb, 1985). This study also shows an association between enrollment in the program and a decrease in health care costs.

Living with Asthma

Living with Asthma was developed at the National Asthma Center in Denver. It is a seven-session group program for children and their families. Children and parents meet separately and each group receives basic information on skills presented in a manner appropriate to their developmental level (Conboy, 1985; National Heart, Lung, & Blood, 1987). A number of teaching techniques are used including lectures, discussions, role-playing, decision making, problem solving, and modeling. Living with Asthma is used for children 7-13 years old and their parents. To evaluate this program125 families were randomized into experimental and control groups. Long term results indicated statistically significant improvements in asthma clinical status as measured with peak flow rates and a significant decrease in school absenteeism in the experimental group (Conboy, 1985; Wilson-Pessano & McNabb, 1985).

Asthma Care Training (A.C.T.) for Kids

This program consists of five 1-hour group sessions for children between the ages of 7 and 12 years and their parents. The program was developed at the University of California, Los Angeles, and disseminated by the Asthma and Allergy Foundation of America (Howell et al., 1992). The focus of the program, 'You're in the driver's seat,' concentrates on teaching children how to make decisions using the concept of traffic signals (red, amber, and

green) which can be related to a child's symptoms at a particular time and to their various medicines (Wilson-Pessano & McNabb, 1985). Seventy-six children were randomly assigned to either control or experimental groups and were evaluated for 1 year after completing the program. A significant difference between experimental and control groups was found in the average number of emergency room visits in the year before vs the year after treatment; 3.04 and 3.71 for controls, compared with 3.68 and 2.30 for those receiving education (Conboy, 1985).

Superstuff

This program was produced under the auspices of the American Lung Association. Superstuff comes in a prepackaged kit containing a newsletter for parents and various teaching materials for children. It may be used at home or in a group setting. For children it teaches the basics of asthma: what it is, how to avoid triggers, early warning signs, and how to make decisions. These concepts are taught through stories, puzzles, games, quizzes, and a recording. The parents' magazine has articles on coping with asthma, how to talk to physicians and teachers, and how to handle emergency situations. In their review of 11 asthma self-management programs, Thoresen & Kirmil-Gray (1983) found the Superstuff curriculum to have the best example of creative educational materials that teach information as well as personal skills. Thoresen & Kirmil-Gray (1983) noted that teaching

materials included activities to teach basic health messages: repetition of the same message in a number of ways and provision of mastery experiences through games and other activities to help children build a sense of self-efficacy concerning management of their asthma. Since Superstuff is a self-contained learning module, it may also be used as a supplemental take-home tool with other group programs (Conboy, 1985). In an evaluation of Superstuff that included 321 families, the experimental group missed significantly fewer days of school after participation in the program than the control group (Conboy, 1985).

Although most of these programs are being used in locations outside the site of their original development, the vast majority of patients with asthma have not received the benefit of such education. The majority of health professionals who treat children with asthma are unaware of these programs, their methodologies, the results of their evaluations and how to use the content and behavior change principles of the programs as a resource in caring for children with asthma (Wilson-Pessano & Mellins, 1987).

Most asthma education programs are based on social and behavioral theories which state that patients can become active participants in their health care and share the responsibility for their health with their health care providers (Hindi-Alexander, 1987). Educational progrmas offer a promising means of improving compliance behavior because sharing responsibilities relieves the provider from carrying the whole burden for a patient's well-being

and also enables the patient to become more active in his/her care (Hindi-Alexander, 1987). Howell et al. (1992) acknowledge that most patient education goes on in the physician's office. However, when a child and his/her parent attend a formal asthma-management course, they increase their knowledge base and understanding of the disease. This helps the primary care provider to develop a more realistic care plan for the child. Asthma self-management requires ongoing involvement of the provider to continually reevaluate and reinforce knowledge and appropriate self-care (Howell et al., 1992). Asthma is such a variable disease that parents and patients must be educated and trained to take appropriate action under a wide variety of circumstances. The nurse practitioner is in a strategic position to assist individuals in self-care programs since self-care practices are particularly prominent at the level of primary care (Chang, 1980).

Orem (1980) defined self-care as the practice of activities that individuals initiate to maintain life, health, and well being. The role of the nurse practitioner is to facilitate the development of self-care skills by educating the child and family, thereby decreasing health care costs, morbidity and mortality, increasing the confidence of the child and family, and minimizing the anxiety with the chronic illness (Orem, 1980). During counseling, the PNP should facilitate the development of self-care skills by the child and family. Orem's self-care nursing model can be effectively used by the PNP.

The Orem Self-Care Nursing Model

Orem (1980) states that the domain of nursing practice can be described as activities in which nurses engage when they provide care. Nursing will never be publicly recognized as science and art until nurses are able to explain why some people need and can benefit from nursing at particular times. The nursing process must grow from a conceptual framework. Without such a framework, the client will be viewed in a random, disorganized fashion (Orem, 1980). When the professional nurse uses a set of standards without a conceptual framework, that nurse is using an implicit framework. For example, an intervention such as providing careful foot care to a diabetic client may be performed because the nurse implicitly believes that prevention of complications is an important part of caring for the diabetic client. However, when a specific theoretical model is applied, the explicit framework can serve as a guideline in a purposeful, conscious, and logical way (Titus & Porter, 1989). Asthma, like diabetes, is a condition that can be principally managed at home. Well informed self-care can ensure minimal admission to the hospital and decreased disruption to the patient's life (Walsh, 1989). Using the diabetes analogy, successful self-care requires the person to have knowledge of diabetes, a means of monitoring blood glucose levels, appropriate medication and, above all, the motivation to be self-caring (Walsh,1989). In the same way, school-age children with

asthma can be taught about their condition, monitor respiratory status at home with a peak flow meter and self-administer appropriate medications. The Orem self-care model for nursing seems an appropriate framework within which to discuss the nursing care required by school-age children with asthma. Orem (1980) stated that the purpose of self-care is to produce an action that has pattern and sequence. When it is performed effectively, it contributes in specific ways to human integrity, functioning, and development. In order to attain this purpose, specific kinds of actions are needed which are termed self-care requisites. There are three types of self-care requisites: universal, developmental, and health-deviation.

Universal self-care includes all demands necessary for the activities of daily living such as air, fluids, food, elimination, rest, activity, solitude, interaction with others, and protection from hazards. Developmental self-care requires maintenance of living conditions that support life processes and promote the processes of development. Health deviation care demands derive from illness, injury, or disease (Orem, 1980; Chang, 1980).

To assist patients in the promotion of health and the prevention, detection, and treatment of illnesses, Orem suggests that individual characteristics of the patients must be considered (Orem, 1980). Orem (1980) discusses the eight universal self-care requisites which are common to all human beings. Before the nurse practitioner can determine the therapeutic self-care demand,

she/he needs to assess the self-care requisites.

Universal Self-Care Requisites

The first, second and third universal self-care requisites are maintaining sufficient intakes of air, water and food. In order to meet these requirements the asthmatic child needs to recognize the early signs of an asthma attack and manage them by resting, relaxing, drinking warm liquid and taking medicines as prescribed for an attack. These are the actions that the child needs to accomplish to meet the therapeutic self-care demands. In order to maintain a sufficient intake of air and to recognize the early signs of an asthma attack, the child needs home peak flow monitoring. Peak flow monitoring provides an objective measure of the severity of the disease and response to therapy and permits detection of airway obstruction before wheezing can be heard with a stethoscope (NHLBI, 1992). Peak flow monitoring also allows the child to begin treatment of episodes early and to decrease the likelihood of serious episodes. Appendix B describes the home peak flow measuring technique. By practicing these techniques, the child can obtain his/her personal best flow meter reading over a 2-week period. This should be done when the child's asthma is under control. Appendix C describes the asthma control plans based on the peak flow zone system which can be used to alert the child to early warning signs of asthma attack.

Providing the asthmatic child with diaries to record antecedents of asthma exacerbations, symptoms, actions to take, outcomes and peak expiratory flow rates improves adherence and increases motivation to control health problems. These actions help the patient to see patterns of triggers and symptoms as well as to monitor response to therapy (NHLBI, 1992). Appendix D is a sample of a weekly symptom and Peak Flow Diary.

To maintain intake of water the child needs to drink warm clear liquids at the first signs of and during an asthma attack. Warm liquids are beneficial because the esophagus is located near the trachea. This allows the warmth from the liquid to spread to the airways to help them relax and dilate. (NHLBI, 1987). Very cold liquids during an asthma attack might worsen the asthma symptoms. In case there are no warm liquids, cold liquids can be taken. A rough guideline is to drink 1-2 eight ounce glasses every 30 minutes during the first hour of the attack, if the child is able, then continue to drink liquids until the asthma attack clears. Drinking liquids during an attack helps to replace the water that is lost by evaporation from the lungs and increased respirations. The liquid that is added back to the body helps to thin the consistency of the mucus and makes it easier for the mucociliary escalator to move mucus up and out (NHLBI, 1987). In addition to resting, relaxing and drinking warm liquids, the child with asthma needs to take medicines as prescribed for an attack (NHLBI, 1987). The child should know that taking medications as prescribed helps the

medicine to be most effective in lowering the chances of having an acute asthma episode.

Children with asthma tend to develop poor breathing habits. This leads to an overworked upper chest and decreased mobility in the lower chest. Children with asthma need to increase the movement of their lower chest (Chow et al., 1984). Breathing exercises are designed to increase abdominal breathing and make for a better exchange of air. Appendix E outlines the steps in proper breathing.

A sufficient intake of food requires the child to have sufficient dietary intake to meet increased or decreased demands. A nourishing diet gives the asthmatic child energy to help resist infections, deliver more oxygen to his/her body cells, and reduce fatigue. The child with asthma should know the side effects of oral steroids. Oral steroids are usually taken for three to seven days during asthma episodes. After one day, they may cause increased appetite, a feeling of well-being, moodiness, or sleeping problems. These medicines can cause long-term side effects and should only be taken under the supervision of a health care provider (American Lung Association, 1993).

The fourth universal self-care requisite is provision of care associated with eliminative processes and excrements. If a child is taking aminophylline, a previously continent child may develop enuresis (Larter, Kieckhefer, & Paeth, 1993). This is an expected clinical effect and will go away after a few days. If the child is older (10-12 years of age), he/she should be able to adjust to

changes in bowel and bladder control due to medication regimen.

The fifth universal self-care requisite is the maintenance of a balance between activity and rest. For this requisite, the child should be able to perform daily activities appropriate for age and exercise to maintain or improve physical strength and endurance. Even with asthma, a child can play and take part in many activities like other kids. The child with asthma medication can follow a plan which he/she has worked out with the health professional. The child should take inhaled $beta_2$-agonist or cromolyn medicine before exercising, warm up before doing exercise and cool down afterwards (NHLBI, 1992). Often the asthmatic child's sleep is interrupted by the onset of cough, wheeze, or other symptoms of respiratory distress (Larter, Kieckhefer, & Paeth, 1993). When asthma episodes occur, the child should control asthma symptoms by following the medicine plan which he/she has developed with his/her health care provider. The child and his/her parent should treat symptoms early, implement appropriate actions for any changes in symptoms, know when a doctor's help is needed, and seek help right away as described in Appendix F and G. By accomplishing these tasks, the child should be able to attain a sufficient sleep-rest pattern to maintain wellness and growth.

The sixth universal self-care requisite is maintenance of a balance between solitude and social interaction. Orem (1980) stated that "the maintenance of a balance between solitude and social interaction provides conditions essential for developmental

processes in which knowledge is acquired, values and expectations are formed, and a measure of security and fulfillment is achieved" (p. 44). In order to achieve this requisite, the child's asthma should not interfere with family, school, and community relationships and activities. The 1988 National Health Interview Survey on Child Health noted that ten percent of children with asthma were reported to be in fair to poor health. After adjustment for demographic factors, those in fair to poor health were twice as likely to report learning disability when compared with those in good to excellent health (Fowler, Davenport & Garg, 1992). These findings suggest that the nurse practitioner should be particularly alert for the risk of grade failure among asthmatic children from lower income families and work together with school teachers to facilitate school functioning. The child and his/her parents should know that people with asthma can live full and active lives. Exercise without symptoms is a realistic treatment goal (NAEP, 1992).

School personnel are often frightened of asthma episodes and are rarely well prepared to cope with them. As a result, children sometimes are barred from sports or from taking medications at school (NAEP, 1992). Asthma is a common but treatable condition. It is very important that children with asthma lead a normal life to increase self-image and decrease a sense of isolation. This can be achieved by reaching an agreement with the child's school. A written statement, Appendix H, for school personnel will guide decisions about the child's participation in activities as well

as about managing acute episodes at school (NAEP, 1990). The child must have access to metered-dose inhalers in school and on the playing field. The intervention of the physician, PNP, school nurse, or asthma education program staff may be necessary for school personnel to be comfortable with these activities (Howell et al, 1992).

The seventh universal self-requisite is prevention of hazards to life, functioning, and well-being. Orem (1980) stated that "prevention of hazards to life, functioning, and well-being contributes to the maintenance of human integrity and therefore to the effective promotion of human functioning and development" (p. 44). In order to achieve this requisite, both the parents and child should have sufficient knowledge or understanding of asthma identification and environmental triggers. They should be able to respond to early warning signs to decrease the chance of exacerbations and receive consistent medical follow-up and care (Walsh, 1989). Appendix I describes a typical asthma trigger control plan.

The eighth universal self-care requisite is the promotion of normalcy. Orem (1980) stated that "the promotion of human functioning and development, in turn, prevents the development of conditions that constitute internal hazards to human life and to human functioning and development" (p. 44). For this requisite, the child should have age-appropriate cognitive-perceptual development. Effective management behaviors can be developed by a positive self concept attitude or, by engaging in physical

activities, being direct and open about asthma with other children and adults, giving information, answering the physician's questions during medical visits, avoiding manipulative behaviors (e.g., threatened attacks), and taking responsibility to control symptoms (Wilson, Mitchell, Rolnick & Fish, 1993). The most direct attempt to alter cognitions regarding self-efficacy was taught in the Supperstuff curriculum. Based on a behavioral competence model, this program provides the child with a number of specific positive self-statements such as: "I am smart, I know how to spot when asthma's getting started." These self-statements are used to assist an asthmatic child to develop self-confidence and use it in the self-management of asthma (Thorensen & Kirmil-Gray, 1983).

Developmental Self-Care Requisites

Orem (1980) said that "developmental self-care requisites are either specialized expressions of universal self-care requisites that have been particularized for developmental process or they are new requisites derived from a condition (e.g., pregnancy) or associated with an event (e.g., loss of a spouse or a parent)" (p. 47). To meet the developmental process, the child should assume age appropriate asthma self-care responsibilities. The child should also be able to cope with the stress of living with chronic asthma, attend school regularly, and should not have school problems such as attention deficit behavior, hyperactivity, fine motor tremor, etc. (Larter, Kieckhefer & Paeth, 1993).

Health-Deviation Self-Care Requisites

These self-care requisites exist "for persons who are ill, are injured, have specific forms of pathology including defects and disabilities, and who are under medical diagnosis and treatment" (Orem, 1980, p. 48). If the child wants to become competent in managing a system of health-deviation self-care, he/she must also be able to apply relevant medical knowledge to his/her own care (Orem, 1980). To meet this requirement, the child should have knowledge of the structure and function of the lungs, a definition of asthma, and the pathophysiology of an asthma episode. The child also should be aware of symptoms that occur when an asthma episode is beginning and should be able to treat and medicate for ongoing management or in response to early warning signs (Larkin, Kieckhefer & Paeth,1993). The child should know early signs that an asthma episode is coming : persistent cough, mild wheezing, breathing somewhat faster, taking longer to breathe out than to breathe in, shortness of breath. When he/she first recognize these signs, he/she should start the treatment plan which he/she and his/her health care provider have developed. The child should check his/her peak flow rates and use medication according to his/her asthma management plan (American Lung Association, 1993). After taking the initial medications as his/her health care provider has prescribed, he/she should try to relax. This will prevent getting anxious and starting to breathe faster.

Therapeutic Self-Care Demand and Self-Care Agency

After determining the therapeutic self-care demand (TSCD), the next step is to determine self-care agency (SCA). Orem (1980) said, "The ability for engaging in self-care, develops in the course of day-to-day living through the spontaneous process of learning" (p. 83). Self-care agency can be examined in relation "to the capacities individuals have, including their skill repertoires and the kinds of knowledge they have and use, for engaging in a range of practical endeavors" (Orem, 1980, p. 83). The adequacy of self-care agency is measured in terms of the relationship of the kinds of operations that the child can perform to meet the TSCD. If the child can not perform the required TSCD, then self-care deficits are determined.

The art of nursing is making a comprehensive determination of the reasons why people can be helped through nursing. Unless self-care agency is accurately diagnosed, nurses have no rational basis for "(1) making judgements about existing or projected self-care deficits and the reasons for their existence, (2) selecting valid and reliable methods of helping, or (3) prescribing and designing nursing systems" (Orem, 1980, p. 84)

Nursing Systems

If the child or parent is lacking a certain kind of knowledge, then the nurse practitioner can determine self-care deficit. Orem

describes three types of nursing systems: wholly compensatory, partially compensatory and supportive-educative. According to Orem's model, the nursing system for asthma self-management education is an educative-supportive one. In an educative-supportive system, the child may have the resources to meet his/her demands, but needs nursing assistance in decision-making, behavior control, or acquisition of knowledge or skills. Using Orem's educative-supportive nursing system, the nurse practitioner can develop an asthma self-management plan based on the child's self-care deficits. The ultimate goal of the educative-supportive nursing system is to promote self-care skills so that the child and parent can comply with the medical regimen to promote health and well-being.

Chapter III

GUIDELINES FOR PEDIATRIC NURSE PRACTITIONER

Developmentally Based Self-Care Using Orem's Theoretical Model

The role of the PNP is to assist the asthmatic child to maintain optimal pulmonary function, minimize symptoms, prevent acute exacerbations, avoid side effects of therapy, and help the child to maintain a normal life-style (Traver & Martinez, 1988). In planning a therapeutic program for a child with asthma, the PNP should obtain the history of illness, perform the physical examination, and initiate diagnostic procedures. The PNP will also need additional information regarding the impact of the child's asthma on both the child and family, a psychosocial evaluation, a socioeconomic evaluation, a review of school performance and attendance, and frequency of emergency room visits and hospitalization (Hen, 1986). At the time the initial diagnosis of asthma is made, patient teaching should begin on the nature of asthma and on the treatment plan (i.e. medical regimen, environmental control, and symptom management).

In order to be successful in teaching self-care to children, the nurse practitioner should include attention to the developmental age as well as cognitive abilities of the child. The years from 6 to 12 are described as industry and turning attention to the outside world (Redman,1980). It is essential to identify the level of responsibility that the child is capable of assuming and the amount and kind of information that can be understood (Howell,

et al., 1992). This essentially agrees with what Tettersell (1992) said about tailoring education to the needs of the client.

The school-age period is described as "an enormous expansion of the child's world, increased independence of thought and behavior, and steady but slow changes in physical growth and maturity" (Chow et al.,1984, p. 405). Tettersell (1993) notes that "Time must be given to establish what the patient wants to know, rather than offering irrelevant information" (p. 109). For the many patients who have difficulty with self-management, education must be aimed at motivating patients and family members to adopt new patterns of behavior on a daily basis (Wilson-Pessano & McNabb, 1985). An effective self-management program does not consist of a passive transfer of information but involves active participation of the child and family for acquisition of skills (Howell et al, 1992; Hindi-Alexander, 1987). The ultimate goal of self-management programs is not self-treatment but to change and improve the care-taking behaviors of individuals (Lewis & Lewis, 1981). Effective management of asthma can only be achieved through cooperative action between parents, clinicians and the patient (Howell et al., 1992; Wilson-Pessano & McNabb, 1985).

Self-care actions may include habitual, deliberate or voluntary behavior. The nurse practitioner's main function is to act as a resource person and facilitator in the decision-making process toward health sought by others (Orem, 1980). Positive reinforcement in the form of praise from the nurse practitioner and

office staff can be invaluable in helping children and their families learn to acquire new skills. However, the most effective reinforcement is success (Howell et al., 1992; Chow et al., 1984). When children and their families relate an improvement in their condition to their adherence to the treatment plan, they will be encouraged to continue it; especially if they were involved in its formation.

Guidelines for the PNP using Orem's self-care model for the care of children with asthma have been developed in table 1. The PNP can use these guidelines in providing age appropriate care. According to Erikson's psychosocial development, industry versus inferiority begins with school age children. Children, at this stage, must apply themselves to their learning, begin to feel some sense of competence relative to peers, and face their own limitations (Chow et al., 1984).

During age six to seven years, children have the ability of learning basic values and skills, systematic and concrete thinking, magical thinking and an ability to direct their own attention but are still easily distractible (Howell et al., 1992). The self-care requirements at this age are using a peak flow meter, taking medications and giving respiratory treatments correctly when adults remind. In order to assist the child to meet the self-care requirements, the PNP can use the educative/supportive nursing system. The PNP can incorporate the "Living with Asthma" curriculum in her/his teaching intervention. Living with Asthma

GUIDELINES FOR PEDIATRIC NURSE PRACTITIONER AND THE CHILD WITH ASTHMA

Age (yrs) Age & developmental Consideration	Self-Care Requirements	Nursing System & Pediatric Nurse Practitioner Intervention
6 to 7 Industry vs. Inferiority - Learns basic values & skills - Thinking is systematic & concrete - Use of magical thinking - Able direct own attention but still ditractable	Learn Basic Skills - Use peak flow meter correctly with adult reminders - Take medications & respiratory tx correctly when adults remind	Educative/Supportive - Establish a partnership with parent & child for asthma self-management - Teach child & parent about asthma using "Superstuff" pamphlet. - Teach child peak flow meter technique (Appendix B). - Praise & reinforce all efforts
7 to 8: Industry vs. Inferiority - Spends many hours with peers - Conform to avoid disapproval - Impatient (especially with self) understand concept of time - Thinking is concrete - Capable of taking another's point of view	Beginning Decision Making - Request medications within 30 minutes of scheduled time - Request & do peak flow meter & nebulizer treatments at scheduled time. Record date, time, & results of peak flow. - Notice, report, & record triggers - Request pretreatments before exercise - Demonstrate proper cleaning of equipment	Educative/Supportive - Develop a medication plan in collaboration with the parent & tailoring of the plan to pt requirements & concerns - Teach child & parent how to use asthma contro plan (Appendix C) - Teach child how to use "My weekly asthma symptom & peak flow diary" (Appendix D). - Teach & provide written information "Asthma trigger control plan" (Appendix I). - Praise & reinforce all efforts
8 to 10: Industry vs. Inferiority - Able to direct own attention - Coorperative play - Reduced dependency by using rituals - Think of own needs first & are out to satisfy them - Strong peer influence	Beginning Responsibility of Managing Asthma - Recognize & report wheezing or tightness - Rest & relax at the first sign of wheezing - Continue to record peak flow meter values at scheduled times. - Demonstrate & use breathing exercises - Parents, adults provide emotional backup when self-care is limited due to wheezing	Educative/Supportive - Teach child abdominal breathing (Appendix E). - Teach parent & child early warning sings & how to manage an episode at home (Appendix F) - Teach parent signs to seek medical care (Appendix G). - Give positive reinforcement for desired behavior & ignore undesirable behavior.
10-12: Industry vs. Inferiority - Begin ability to think abstractly - Same sex peers important - Modest with parents - Improved communication skills	Decision-making and Responsibility - Know medications: including dose, times, action, indications, contraindications & side effects - Assume responsibility for taking own meds - Update med records to reflect changes	Educative/Supportive - Teach child & parent about asthma medications. - Encourage to talk about asthma to school teacher by providing a letter from clinition to school personnel (Appendix H). - Praise & reinforce all efforts.

Adapted from Howell, Flaim & Lung, 1992

focuses on teaching asthma skills to children and providing parents with the knowledge and behavior modification skills to help their children take over management responsibility (Conboy, 1985). The first step is establishing a partnership with parent and child for asthma self-management. To establish a partnership means to open communication, to develop a treatment plan based on collaboration between the clinician and patient, and to encourage the family's efforts to improve prevention and treatment of symptoms (NAEP, 1992). After establishing a partnership, the PNP can teach the child and parent about asthma using the "Superstuff" curriculum. Superstuff comes in a prepackaged kit containing a newsletter for parents and various teaching materials for children ages 6 to 8 and may be used at home or in a group setting. The Supperstuff package can be obtained by contacting the local American Lung Association. After accomplishing this task correctly, the child and parent should be asked what they have learned and encouraged to ask questions. This helps to keep the lines of communication open and reinforces the family's use of self-care skills.

The seven to eight year old child spends many hours with peers, conforms to avoid disapproval, is impatient, especially with self, understands the concept of time, has thinking that is concrete, and is capable of taking another's point of view (Howell et al., 1992). At this age, the child should request medications within 30 minutes of the scheduled time, and request peak flow

meter and nebulizer treatments at scheduled times, He/she records date, time and results of peak flow readings in the peak flow diary. The child should be able to notice, report and record triggers, request pretreatments before exercise and demonstrate proper cleaning of equipment. In order to assist to meet these requirements, the PNP can teach the child how to use "Asthma Control Plans According to the Peak Flow Zone System," "My weekly Asthma Symptom and Peak Flow Diary" in Appendix C and D and "Asthma Trigger Control Plan" in Appendix I. Again, the PNP should ask the child and parents what they have learned and encourage them to ask questions. The PNP can help by applying positive reinforcement. For example, when the child and parents perform the required tasks correctly, then the PNP can reinforce with smiles, a pat on the back, attention, and an encouraging word, look and praise.

At age eight to ten years old, the child needs to apply to learning tasks and begin to feel some sense of competence (Howell et al., 1992). At this age, the child begins to take responsibility of managing his/her own asthma. The child is able to recognize and report wheezing or chest tightness and manage these episodes by resting as needed. The child continues to record peak flow meter values at scheduled times and demonstrates and uses breathing exercises when an asthma attack occurs. Keeping the developmental considerations in mind the PNP can assist the child to meet these self-care requirements. The PNP can show how to

perform the abdominal breathing exercises and teach the parent and child the early warning signs and how to manage an asthma attack at home as described in Appendix F. The parent should be taught signs to seek medical care as described in Appendix G.

At age ten to twelve years the child begins to think abstractly. Same sex peers are important and communication skills are improved (Howell et al, 1992). The child knows medications including dose, times, action, indications, contraindications and side effects. He/she assumes responsibility for taking own medications and updates medication records to reflect changes. To achieve these requirements, the PNP can teach the child and parent about asthma medications. The PNP can encourage discussion about asthma with school teachers by providing a letter to school personnel like the one in Appendix H. The PNP's position as a health care professional may be a positive influence in eliciting cooperation from school officials.

The Supperstuff curriculum teaches that even if he/she has asthma, the child can grow up and be anything he/she wants to be. In order to reinforce asthma self-management techniques, there are children's asthma camps available throughout the country sponsored by organizations including local and state American Lung Associations. These camps encourage children with asthma to enjoy outdoor activities without physical or psychosocial impairment. PNP should provide list of when camps are held.

In reviewing existing asthma self-management programs, most have produced fewer asthma attacks, reduced school absenteeism and ER visits. Information from asthma self-management programs, as well as Orem's self-care theory provided a sound foundation to develop the guidelines in table 1. By using the guidelines described in table 1, the PNP can teach and reinforce self-management skills to the child and parent at each office visits and help the child and family to achieve self-care management skills.

Chapter IV.

IMPLICATIONS

Summary of Literature

Death due to asthma is not a new phenomenon, but until recently it has not been widely recognized (Sears, 1988). Despite improved medical therapeutics, mortality and morbidity rates from asthma have increased over the past decade. Data regarding limitation of activity, number of days lost from school, and hospitalization rates all indicate a trend toward increasing morbidity from asthma in children under 15 years of age (Bloomberg & Strunk, 1992). The rate of increase was greatest in children aged 5-14 years and somewhat slower in individuals aged 15-34 years (Conboy, 1985). Explanations for rising prevalence, morbidity, and mortality are varied.

In 1975, the cost of caring for the approximately 8 million asthma patients in the United States was estimated to be $805,721,000 (NIAID, 1979). Reinke and Hoffman (1992) stated that in 1990, Americans spent an estimated $1.6 billion on asthma-related in-patient hospital care and another $295 million on emergency services. Halfon and Newacheck (1993) have attributed increased hospitalization to changes in the natural history and severity of the disease, improved diagnosis, untoward effects of treatment, and increased tendencies for asthmatic patients to use hospital emergency departments as primary sources of care.

Bloomberg & Strunk (1992) point out that although there are

children who die unexpectedly, most deaths are believed to be preventable. Early communication with the health care provider that prompts a change in therapy is lacking in many of the case histories of deaths. Relatively inexpensive intervention strategies-such as health education, regular follow-up, and preplanned home care can substantially reduce hospitalization and emergency department visits. (Reinke & Hoffman, 1990). Because patient behavior plays a major role in the prevention or precipitation of acute asthma attacks, the educator role of the PNP is of vital importance.

The health care provider needs to develop a strategy for management of high-risk children with asthma. Patient and family education should be undertaken in conjunction with an effective therapeutic regimen that reduces and controls symptoms and improves lung function (Bloomberg & Strunk, 1992). Patient education should begin at the time of diagnosis and be integrated with continuing care (NAEP, 1991).

At least 11 asthma education programs for children have been developed since 1977 in the U.S. Evidence from these programs indicates that they can produce decreased asthma morbidity as measured by fewer hospitalizations and emergency room visits (Hindi-Alexander, 1987,; Wilson-Pessano & McNabb, 1985). Most of these programs encourage self-management. Self-management education provides the patient with educational experiences to promote changes in behavior that will lead to improvements in

health status and enhancement of the quality of life (Wilson-Pessano & McNabb, 1985; Conboy, 1985). Several standardized asthma education programs can be obtained from the National Heart, Lung and Blood Institutes, the American Lung Association, and the Asthma and Allergy Foundation of America. These programs advocate increased transfer of the management of the child's asthma from the primary health care provider to the family and/or the child (Lewis,1983). All programs involve the parent and use examples of interactive skills to translate medical advice into practice in the family's daily life (Conboy, 1985).

Thorensen and Kirmil-Gray (1983) note that the best example of creative educational materials that teach information as well as personal skills and encourage the use of these skills is the Supperstuff curriculum. Thorensen and Kirmil-Gray (1983) also note that, "Living with Asthma" which was developed at the National Asthma Center, provided the most comprehensive use of powerful methods of behavior change. Children learned how to observe and record their general physical condition, medication use, and performance during morning and evening trials on peak flow meters. This information in turn was reported to be helpful in making decisions about daily activities and appropriate treatment (Thorensen & Kirmil-Gray, 1983).

Orem's self-care deficits theory suggests that nursing care should involve helping people meet deficits in their own or their family's self-care (Orem, 1980). In the asthma self-management

education portion, the child and parents require educative/supportive nursing assistance. Clinical nurse specialist (CNS) intervention based on the Orem Self-Care Nursing Model was shown to significantly reduce ER utilization by asthmatic children from low-income families. Such intervention also clearly demonstrates the importance of patient education in decreasing asthma related morbidity and the potential for the nurse to make a difference (Alexander et al., 1988). Conboy (1990) states that the goal of self-care in asthma is teaching families how to make informed decisions about their child's asthma with the assistance of their health care providers.

Recommendations for Future Nursing Practice, Theory and Research

Nursing Practice

In order to be successful in teaching self-care to children, the PNP should include attention to the developmental age as well as cognitive abilities of the child. It is essential to identify the level of responsibility that the child is capable of assuming and the amount and kind of information that can be understood (Howell, et al., 1992). Tettersell(1993) notes that "Time must be given to establish what the patient wants to know, rather than offering irrelevant information" (p. 109). For the many patients who have difficulty with self-management, education must be aimed at motivating patients and family members to adopt new patterns of behavior on a daily basis (Wilson-Pessano & McNabb, 1985). An effective self-management program does not consist of a passive transfer of information but involves active participation of the child and family for acquisition of skills (Howell et al.,1992; Hindi-Alexander,1987). Effective management of asthma can only be achieved through cooperative action between parents, clinicians and the patient (Howell et al.,1992).

Self-care actions may include habitual, deliberate or voluntary behavior. The PNP's main function is to act as a resource person and facilitator in the decision-making process toward health sought by others (Orem, 1980). Positive reinforcement in the form

of praise from the PNP and office staff can be invaluable in helping children and their families learn to acquire new skills. However, the most effective reinforcement is success (Howell et al., 1992).

Information from asthma self-management programs, as well as Orem's self-care theory provide a sound foundation to develop the guidelines in Table 1. These guidelines also can be effectively used in school settings. School nurses' main focus is health maintenance and promotion of health. The school nurses are in an ideal place for teaching and reinforcing asthma self-management in children. School nurses can follow the guidelines in determining self-deficit areas and if the asthmatic child and parent are lacking knowledge the school nurse can teach and reinforce the identified area. These guidelines also can be used by pediatric nurses who work in hospital or ambulatory care clinics.

In practice, the PNP and pediatric nurses can use these guidelines to provide age appropriate care. According to Erikson's psychosocial development, industry versus inferiority begins with school age children. The years from 6 to 12 are described as industry and turning attention to the outside world (Redman, 1980). Children, at this stage, must apply themselves to their learning, begin to feel some sense of competence relative to peers, and face their own limitations (Chow et al., 1984). The school-age period is described as "an enormous expansion of the child's world, increased independence of thought and behavior, and steady but slow changes in physical growth and maturity" (Chow et al., 1984,

p. 405).

During age six to seven years, children have the ability of learning basic values and skills, possess magical thinking and are easily distractible (Howell et al., 1992). The appropriate self-care actions at this age can be using a peak flow meter, taking medications and giving respiratory treatments correctly when adults remind. In order to assist the child to meet the self-care requirements, the PNP and pediatric nurses can use the educative/supportive nursing system. The first step is establishing a partnership with parent and child for asthma self-management. To establish a partnership means to open communication, to develop a treatment plan based on collaboration between the clinician and patients, and to encourage the family's efforts to improve prevention and treatment of symptoms (NAEP, 1992). After establishing a partnership, the PNP and pediatric nurses can teach the child and parent about asthma using the "Superstuff" curriculum. Superstuff comes in a prepackaged kit containing a newsletter for parents and various teaching materials for children ages 6 to 8 and may be used at home or in a group setting.

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records date, time and results of peak flow readings in the peak flow diary and is able to notice, report and record triggers. The child can request pretreatments before exercise and demonstrate proper cleaning of equipment. In order to assist to meet these requirements, the PNP and pediatric nurses can teach the child how to use "Asthma Control Plans According to the Peak Flow Zone System," "My weekly Asthma Symptom and Peak Flow Diary" in Appendix C and D, and "Asthma Trigger Control Plan" in Appendix I. The PNP and pediatric nurses should ask the child and parents what they have learned and encourage them to ask questions. The PNP and pediatric nurses can help by applying positive reinforcement. For example, when the child and parents perform the required tasks correctly, then the PNP and pediatric nurses can reinforce with smiles, a pat on the back, attention, and an encouraging word, look and praise.

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Nursing Theory

The use of Orem's Self-Care Model with developmental age appropriate self-care tasks offers a practical approach to assessment of patient teaching needs. The purpose of self-care is to produce an action that has pattern and sequence. When it is performed effectively, it contributes in specific ways to human integrity, functioning, and development (Orem 1980). Asthma, like diabetes, is a condition that can be principally managed at home. Well informed self-care can ensure minimal admission to the hospital and decreased disruption to the patient's life (Walsh, 1989). Nursing care should involve helping people meet deficits in their own or their family's self-care. Orem's theory is an excellent tool in teaching and assisting the client to meet the goal of self-management which is to change and improve the care-taking behaviors. Orem's theory allows the PNP to more precisely determine what tasks the patient is capable of handling versus what tasks they are currently performing. By determining each patient's level of knowledge deficit the PNP can design specific patient-appropriate teaching plans that take into account the current individual knowledge and motivational level.

Nursing Research

These guidelines can be used in conducting a research project at outpatient offices, hospitals or school settings by PNPs and pediatric nurses. One research design could be a random

assignment of groups; Asthma self-management teaching using the guidelines in table 1 (group A) versus using only the "Living with Asthma" curriculum (group B). Group A will receive teaching guidance according to table 1. In table 1, the PNP and pediatric nurses will use Orem's self-care model and adjust their teaching method to the developmentally appropriate level. Group B will receive only the "Living with Asthma" curriculum without regard to specific developmental considerations. At the end of the research period, the group results then can be measured by the number of ER visits, hospitalizations and school absenteeism compared by previous years and between groups.

Finally, it is essential that all PNPs and pediatric nurses who work with asthmatic children recognize and acknowledge the importance of asthma self-management education. By using the guidelines described in table 1, the PNP and pediatric nurses can teach and reinforce self-management skills to the child and parent at each office visit, in a school setting or hospitalization and help the child and family to achieve self-management skills.

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APPENDIXES

Appendix A. Steps for Correct Inhaler Technique

1. Shake the container well.
2. Remove cap and hold inhaler upright.
3. Position the inhaler 1 or 2 inches from mouth.
4. Tilt head back slightly and breathe out.
5. Press down on the inhaler and start to breathe in slowly.
6. Breathe in slowly (3-5 seconds) (3 seconds is minimum; this allows for deeper penetration of the medication).
7. Hold breath for 10 seconds (younger children can start with a 5-second breath hold).
8. This allows the medicine to be retained in the lungs.
9. Take a few normal breaths.
10. Repeat puffs as directed

Adapted from Howell, et al., 1992.

Appendix B. Technique for Measuring a Peak Flow

1. Place the indicator at the base of the numbered scale.
2. Stand up.
3. Take a deep breath.
4. Place the meter in your mouth and close your lips around the mouth piece.

   Do not put your tongue inside the hole.
5. Blow out as hard and fast as you can.
6. Write down the number you get.
7. Repeat steps 1 through 6 two more times.
8. Write down the highest of the three numbers achieved.

Adapted from NHLBI, 1992.

Appendix C. Asthma Control Plans

Once you know your personal best peak flow number, your doctor will give you the number that tell you what to do. The peak flow numbers are put into zones that are set up like a traffic light. This will help you know what to do when your flow number changes. For example:

Green Zone (80 to 100 percent of your personal best number) signals all clear. No asthma symptoms are present, and you may take your medicines as usual.

Yellow Zone (50-80 percent of your personal best number) signals caution. You may be having an episode of asthma that requires an increase in your medicines. Or your overall asthma may not be under control, and your doctor may need to change your medicine plan.

Red Zone (below 50 percent of your personal best number) signals a medical alert. You must take an inhaled beta-agonist right away and call your doctor immediately if your peak flow number does not return to the Yellow or Green Zone and stay in that zone.

Adapted from National Heart, Lung, Blood Institute, 1992.

Appendix D. My Weekly Asthma Symptom and Peak Flow Diary

___My predicted peak flow ___My personal best peak flow
___My Green (OK) Zone (80-100% of personal best)
___My Yellow (Caution) Zone (50-80% of personal best)
___My Red (Danger) Zone (below 50% of personal best)

Date a.m. p.m. a.m. p.m. a.m. p.m. a.m. p.m. a.m. p.m.

Peak Flow

No Symptoms

Mild

Moderate

Severe

1. Take your peak flow reading every morning (a. m.) when you wake up and every night (p.m.) at bedtime. Try to take your peak flow readings at the same time each day. Write down the highest reading of three tries in the box that says peak flow reading.
2. Look at the box in the upper left of this sheet to see whether your number is in the green, yellow, or red zone.
3. In the space below the date and time, put an "X" in the box that matches the symptoms you have when you record your peak flow reading.
4. Look at your asthma control plan for what to do when your number is in one of the zones and you have asthma symptoms.
5. Put an "medicine use" or "urgent visit" if you took extra asthma medicine or visited emergency room to stop your symptoms.

No symptoms = No symptoms (wheeze, cough, chest tightness, shortness of breath) even with normal physical activity.

Mild symptoms = Symptoms during physical activity, but not at rest. It does not keep you from sleeping or being active.

Moderate symptoms = Symptoms while at rest; symptoms may keep you from sleeping or being active.

Serious symptoms = Serious symptoms at rest (wheeze may be absent symptoms cause problems walking or talking; muscles in neck or between ribs are pulled in when breathing.

Adapted from NHLBI, 1992.

Appendix E. How to Practice Abdominal Breathing

1. Lie on the floor, bend your knees, keep your feet on the floor, and put one hand on your chest and the other hand on your stomach.

2. Breathe in through your nose, and make your stomach get round like a ball. Your chest should not move.

3. Blow all the air out through your mouth with your lips pursed, and use the hand on your stomach to help you push all the air out. Your stomach should be flat.

Practice abdominal breathing 10 times, slowly, making sure that your chest remains still. Try practicing this twice-a-day. Whenever you have a hard time breathing, sit, leaning forward with a straight back, arms on your knees. Now breathe through the nose, then blow all the air out through the mouth slowly, keeping your chest still. Breathing this way may make you feel better and less tired.

Adapted from Chow at al., 1984.

Appendix F. Steps To Manage an Asthma Episode at Home

- Know your child's early warning signs so you can begin treatment early.

- Give the prescribed amount of medicine at the times or intervals the doctor has indicated. If your treatment plan includes increased dosage or a second medicine to be used during episodes, give it as instructed. If you need to give more medicine that prescribed, notify your clinician.

- Remove, if possible, an allergen or irritant if one or the other triggered the child's episode. Treatment is less effective if there is continued exposure to a trigger.

- Keep yourself and your child calm and relaxed.

- Have your child rest while you observe the progress of therapy.

- To monitor your child's condition, note change in body signs like posture, difficulty breathing, wheeze, and cough. If you have a peak flow meter, test the child's peak flow rate 5-10 minutes after each treatment to see if airflow is returning to normal.

- Call a family member, friend, or neighbor to help you if needed.

- Call the clinic, doctor's office, or hospital for help if needed.

Adapted from NAEP, 1990.

Appendix G. Signs To Seek Medical Care

- Wheeze, cough, or shortness of breath gets progressively worse, even after the medicine has been given and had time to work. Most inhaled bronchodilator medications produce a noticeable and significant effect within 5-10 minutes. Discuss the time your child's medications take to work with your doctor.

- Peak flow rate declines or stays the same following treatment with bronchodilators or drops to 50 % or less of the child's normal baseline level (personal best or predicted, as Determined by the clinician). Discuss this peak flow level with your doctor.

- Child has a hard time breathing. Signs of this are:
  - -child's chest and neck are pulled or sucked in with each breath.
  - -Child is hunched over.
  - -Child is struggling to breathe.

- Child stops playing and cannot start any activity again.

- Child's lips or fingernails are grey or blue. If this happens, take your child to the doctor or emergency room. immediately!

Adapted from NAEP, 1990.

Appendix H. Sample Letter from Clinician to School Personnel

Information on Asthma for Teachers

Name: _____
Is participating in an asthma self-management program. This student is working with us to help take care of her or his asthma. The following guidelines will help you maximize the student's participation in all school activities.

- Full participation in all physical activities to the limits of tolerance is essential to health. The student should be allowed to rest if necessary during this physical exertion and use inhaled medications as needed.

- Medication is important in the treatment of asthma. The student must take medicine by the following schedule:

a. time _____every day.

b. as needed if symptoms of coughing, wheezing, congestion, or chest tightness occur.

Your cooperation in this medication schedule will help prevent any asthma problems. Please allow this child to keep asthma medications with him or her to use as needed or directed.

- If asthma symptoms come on during school or gym activities, inhaled medication and rest will help to control the symptoms. This student knows the early warning signs that tell him or her to stop and to rest and use inhaled medication as needed.
- Some children may have a peak flow meter with them and know what readings indicate worsening asthma. Use this information to guide decisions. Remember higher readings mean the airway is opening and asthma is getting better. Lower readings mean the airway is tightening and asthma is getting worse.
- If symptoms get worse or don't improve within 15-30 minutes after the medicine is taken, then the student's family should be notified.
- If you have further questions about this student's asthma, please call the clinician:

_____(name) at_____(phone)

Adapted from NAEP, 1990.

Appendix I. Asthma Trigger Control Plan

Because you have asthma, your airways are very sensitive. They may react to things called triggers (stimuli that can cause asthma episodes). Your airways may become swollen, tighten up, and produce excess mucus in the presence of one or more of the triggers below. It's important to find out what your asthma triggers are and learn ways to avoid them. If you cannot avoid triggers, and your medicine plan does not work as well as you and your doctor think it should, you both should discuss allergy shots (immunotherapy).

Pollen and Molds (outdoor)
- Stay indoors during the midday and afternoon when the pollen count is high.
- Use air conditioning, if possible.
- Keep windows closed during seasons when pollen and mold are highest.
- Avoid sources of molds (a wet leaves, garden debris).

House Dust Mites
These are actions you should take to gain control of dust mites:
- Encase your mattress and box spring in an airtight cover.
- Either encase your pillow or wash it once a week every week.
- Avoid sleeping or lying on upholstered furniture.
- Remove carpets that are laid on concrete.
- Wash your bed covers, clothes, and stuffed toys once a week in hot (130 degree F) water.

These actions will also help you gain control of dust mites-but they are not essential:
- Reduce indoor humidity to less than 50 percent. Use a dehumidifier if needed.
- Remove carpets from your bedroom.
- Use chemical agents to kill mites or to change mite antigens in the house
- If you must vacuum, one or more of the following things can be done to reduce the amount of dust you breathe in.
    . Use a dust masks.
    . Use a central vacuum cleaner with the collecting bag outside the home.
    . Use a vacuum cleaner that has powerful suction.

Animal Dander (or flakes-from the skin, hair, or feathers of all warm-blooded pets including dogs, cats, birds, and rodents). There is no such thing as an allergen-free dog. The length of a pet's hair does not matter. The allergen is in the saliva, urine, and dander.

- Remove the animal from the house or school classroom.
- If you must have a pet, keep the pet out of your bedroom at all times.
- If there is forced-air heating in the home with a pet, close the air

ducts in your bedroom.
- Wash the pet weekly.
- Avoid visits to friends or relatives with pets.
- Take asthma medicine (cromolyn or $beta_2$-agonist; cromolyn is often preferred) before visiting homes or sites where animals are present.
- Choose a pet without fur or feathers (such as a fish or a snake).
- Avoid products made with feathers, for example, pillows and comforters. Also avoid pillows, bedding, and furniture stuffed with kapok (silky fibers from the seed pods of the silk-cotton tree).
- Use a vacuum cleaner fitted with a HEPA (high-efficiency particulate air) filter.

Cockroach Allergen
- Use insect sprays: but have someone else spray when you are outside of the home.
- Air out the home for a few hours after spraying.
- Use roach traps.

Indoor Molds
- Keep bathrooms, kitchens, and basements well aired.
- Clean bathrooms, kitchens, and basements regularly.
- Do not use humidifiers.
- Use dehumidifiers for damp basement areas, with humidity level set for less than 50 percent but above 25 percent. Empty and clean unit regularly.

Tobacco Smoke
- Do not smoke.
- Do not allow smoking in the home.
- Have household members smoke outside.
- Do not allow any smoking in your bedroom. Encourage family members to quit smoking. Their doctor can help them quit.
- Use an indoor air-cleaning device (for smoke, mold, and dander).

Wood Smoke
- Avoid using a wood burning heat stove to heat your home. The smoke increases lower respiratory symptoms.
- Avoid using kerosene heaters.

Strong Odors and Sprays
- Do not stay in your home when it is being painted. Allow enough time for the paint to dry.
- Avoid perfume and perfumed cosmetics such as talcum powder and hair spray.
- Do not use room deodorizers.
- Use nonperfumed household cleaning products whenever possible.
- Reduce strong cooking odors (especially frying) by using a fan and opening windows.
- Avoid air pollution by staying indoors on days when the pollution count is high.

Colds and Infections
- Avoid people with colds or the flu.
- Get rest, eat a balanced diet, and exercise regularly.
-Talk to your doctor about flu shots.
- Do not take over-the-counter cold remedies, such as antihistamines and cough syrup, unless you speak to your doctor first.

Exercise
- Work out a medicine plan with your doctor that allows you to exercise without symptoms.
- Take inhaled $beta_2$-agonist or cromolyn medicine before exercising.
- Warm up before doing exercise and cool down afterwards.

Weather
- Wear a scarf over your mouth and nose in cold weather.
- Pull a turtleneck over your nose on windy or cold days.
- Dress warmly in the winter or on windy days.

REMEMBER: Making these changes will help keep asthma episodes from starting. An asthma trigger control plan is an important part of controlling asthma.

Adapted from NHLBI, 1992.